Whither the permanent cardiac pacemaker?

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The rapid development and clinical application of cardiac pacemakers have brought the patient, physician and hospital into an electronic era for which none are adequately prepared.

As a therapeutic modality, cardiac pacing has beneficially altered the prognosis of heart block, providing a simple, effective means to prevent recurrent syncope and allow gratifying rehabilitation of elderly patients. As surgical procedures, insertion and replacement of permanent transvenous pacemakers are associated with minimal risk and are perhaps the commonest operations performed on the heart today. None the less, outside of university centres and some larger hospitals within metropolitan areas, there are few physicians familiar with pacemaker therapy; generally speaking, facilities for the management of patients with pacemakers are indeed limited. We are presented, then, with the paradox of a new dimension being added to geriatric care and community health, while available medical and hospital provisions are inadequate.

The magnitude of the problem is revealed by the increasing number of pacemaker procedures performed at the Toronto General Hospital over the past 10 years (Fig. 1). The logistics problem becomes more apparent when this increase is superimposed upon the growth of the total cardiovascular surgical case-load—particulary the rapid increase in the number of "open-heart" procedures, which require considerable time and personnel (Fig. 2). By mid-1971 the insertion and replacement of pacemakers became a burden on the available beds, budget and operating time. The management of such numbers became a physical challenge and a frustration to both physician and patient, prompting us to review the status and direction of pacemaker therapy in our institution.

Let us first examine the indications for permanent cardiac pacing. Are they too liberal or too aggressive, thereby accounting for the tremendous increase in patient load? The classic indication for insertion of a fixed-rate pacemaker has always been established third-degree atrioventricular block, in patients suffering from

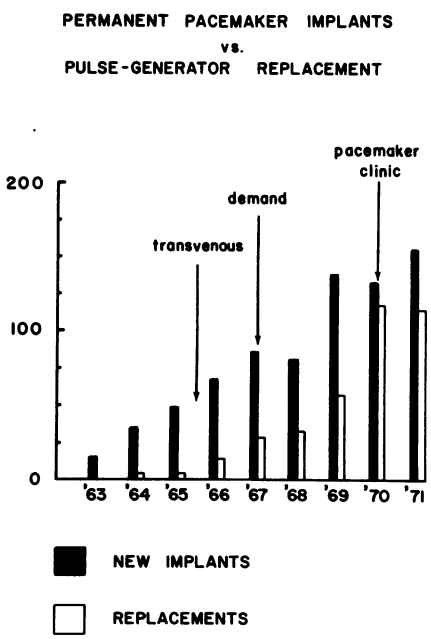

FIG. 1—Graph revealing the increasing application of pacer therapy, most notably after introduction of: (a) permanent transvenous units; (b) demand mode pacemakers; (c) establishment of a Pacemaker Clinic.

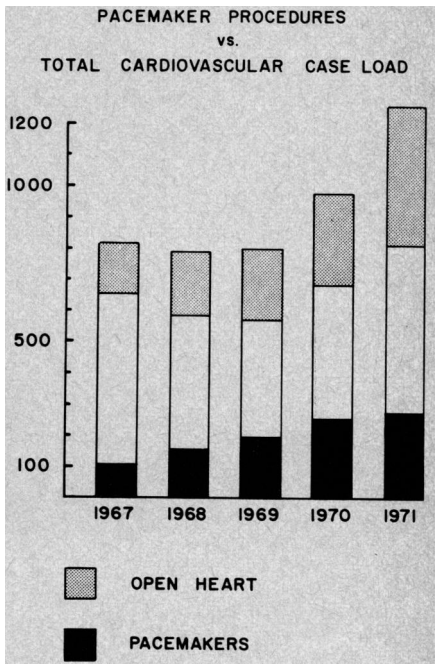

FIG. 2—Graph relating the pacemaker procedures to the total cardiovascular surgical case-load at the Toronto General Hospital. The dramatic increase in "open-heart" surgery parallels the pacer increase, in a department with a constant number of beds, operating rooms, etc.

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Stokes-Adams syndrome or other manifestations of low cardiac output. However, newer diagnostic techniques have since allowed recognition of intermittent heart block in patients presenting with sinus rhythm. Awareness of the natural history of bundle branch lesions, electrocardiographic clues to the diagnosis of intermittent block with syncope, the availability of continuous electrocardiographic monitoring and intracavitary conduction studies have all permitted a greater number of patients to benefit from pacer therapy. Since introduction of standby or demand mode pacemakers for the treatment of incomplete or intermittent heart block, the number of implants has risen dramatically.

A Pacemaker Clinic was established to ensure accurate measurement of the functional integrity of the pacemakers and to determine the maximum longevity of their components, and thus provide security for the patient. The clinic was necessary for data collection and patient retrieval, because of the high incidence of catastrophic battery failure in patients being managed by a wide group of physicians and surgeons, many of whom had no established criteria for anticipating component failure. In the second year of the clinic's operation the number of visits has tripled (being almost 1000 patient-visits in 1971) and will soon be beyond the capacity of the single secretary-technician approved and allotted by OHSC. Since establishment of the clinic, there are few emergency pulse-generator replacements, the majority now being performed as elective procedures. To manage this increasing volume of elective battery-pack replacements, the hospital and nursing administration have co-operated to facilitate this procedure on an out-patient, "no-bed-required" basis, thereby saving time, money and hospital beds.

Although this development has helped to ease our immediate problems, what can we expect in the future? It will not be possible for our hospital to continue to implant new pacemakers and replace failed batteries if the growth rate demonstrated in the past few years continues. Some form of limit will have to be imposed. Although the concept of regional care centres has not yet been defined by the Government, it seems obvious that it will be incumbent upon local hospitals and community physicians to become familiar with pacemaker problems and their surgical management. Furthermore, it does not seem appropriate that the salesmen for various commercial pacemaker firms should be the instructors and teachers for these physicians. In anticipation of this need for education throughout the province of Ontario, the University of Toronto presented a Conference on Pacemaker Therapy in Toronto on Friday, April 7, 1972, under the aegis of the Ontario Heart Foundation and the Division of Postgraduate Medical Education.

Our suggestion is that through such an educational program, a regional network of pacemaker clinics be established at large hospitals throughout the province, supported by the Ontario Hospital Services Commission. Such peripheral clinics would save patients considerable travelling expense, decrease their anxiety and at least allow for the efficient replacement of failed pulse-generators at the local community level. Through trans-telephone monitoring facilities, computer-based data collection at certain university hospitals could work in concert with a regional or peripheral pacemaker clinic to assist in diagnostic problems or replacement criteria.

The ultimate answer lies in the development of better energy sources and component reliability within pacemaker units. In this era of space age technology and electronics, it seems extraordinary that commercial biomedical firms, most of which are supplied by the same battery manufacturer, should not yet have provided a more reliable pacemaker with a greater life span. The numerous changes in circuit design, the various added safeguards, the frequent model changes—all these features are reminiscent of the planned obsolescence in the automobile industry. Since the cost of pacemaker hardware, in Ontario alone, for 1971 is estimated to be more than a million dollars, it would appear that both the Hospital Commission and the Food and Drug Administration are as mesmerized by the "mystique" of pacemakers as most physicians, and are similarly avoiding their responsibility for becoming familiar with, and assessing the cost of, this valuable form of therapy.